

# Smoking in the Kingdom of Tonga: report from a national survey

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## Abstract

**Objective** – To measure the prevalence of smoking amongst adults in the Kingdom of Tonga

**Design** – Cross-sectional survey.

**Setting** – Villages and census blocks throughout the Kingdom, selected by stratified cluster sampling.

**Participants** – 4065 adults aged 20 years and over, interviewed during July 1991.

**Main outcome measure** – Self-reported smoking behaviour.

**Results** – The response rate was estimated to be about 78% and the study population numbered approximately 9% of the national population aged 20 years and over. Current smoking (defined as smoking in the three months prior to the survey) was reported by 62% of men and 14% of women. The national prevalence of smoking, adjusted for the sampling weights used in this study, is estimated to be 64.8% (95% confidence interval = 58.7%–71%) for men and 13.7% (9.9%–17.6%) for women. The highest proportions of smokers were found amongst young and middle-aged men, but the prevalence of smoking tended to increase with age amongst women. Smoking was negatively related to years of education, more so amongst women than men. Amongst men, smoking was more common in rural areas than in the capital city. The pattern for women was quite different, with higher rates of smoking reported in the city than in rural areas. Amongst ever-smokers, women were more likely to report that they had quit than were men, in all age groups. It is not known whether smoking rates are changing in Tonga as there are no earlier comparable data.

**Conclusions** – Tonga will experience high levels of tobacco-related disease in the future, especially amongst men, unless smoking rates are reduced.

(*Tobacco Control* 1994; 3: 41–45)

## Introduction

In developing countries of the world, smoking is becoming more important as a cause of ill-health as tobacco consumption increases, smokers change from traditional forms of tobacco to commercially manufactured cigarettes, and other causes of mortality and morbidity are reduced.<sup>1</sup>

In the Pacific, tobacco has been used for more than 150 years since it was first introduced by traders, whalers and other European visitors to the islands. However, manufactured cigarettes were rarely smoked by the local peoples until after the Second World War, and did not replace home-grown and twist tobacco in most countries until the 1960s.<sup>2</sup>

The prevalence of tobacco smoking in modern times appears to vary markedly from one Pacific nation to another. Surveys carried out between 1975 and 1981 in eight Pacific island nations (Tonga not included) reported smoking prevalence rates amongst men from 38% in the Cook Islands to 88% in Kiribati.<sup>3</sup> Rates in women were lower, and ranged from 19% (Cook Islands) to 70% (Kiribati). The only study of smoking prevalence in Tonga<sup>4</sup> consists of a survey conducted in 1973 of 791 persons in Nuku'alofa and Foa Island, in which 80% of men and 24% of women reported "regular smoking".

The aim of this survey was to obtain up-to-date information on smoking from a large sample, representative of the Tongan national adult population, to assist plans for control of tobacco-related disease in the Pacific.

## Methods

The Kingdom of Tonga includes approximately 100 000 people, living on 40 islands, spread over 360 000 km<sup>2</sup> of ocean. It is the only country in the Pacific that has not been colonised by a foreign power. The population is Polynesian, literate, lives mainly in rural areas, and shares a Gross Domestic Product estimated in 1991 to be about US\$1280 per person.<sup>5</sup> Life expectancy is estimated to be approximately 67 years (men and women combined), and heart disease and cerebrovascular disease are now the most commonly reported causes of death.<sup>6</sup>

This survey of smoking behaviour was combined with a study of the frequency and causes of blindness and low vision. The study was limited to the adult population of Tonga, and aimed to include approximately 10% of persons aged 20 and over. The study methods are described in detail elsewhere.<sup>7</sup>

The study population was selected by stratified cluster sampling, based on the results of the 1986 national census of Tonga.<sup>8</sup> Within statistical divisions, villages were selected randomly until the accumulated number of adults aged 20 years and over exceeded 10% of

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the total in the division. Nuku'alofa, which is the capital of Tonga and the only substantial urban area in the Kingdom, was sampled separately, using census blocks.

The study areas were visited during July 1991 by two survey teams, consisting of Tongan health workers, fluent in Tongan and English. All households in the study areas were visited, the resident population was enumerated, and interviews sought with persons aged 20 years and over. Special efforts were made to include those at work, by visits very early in the morning, and in the evening. Interviews were conducted wherever participants were found, including homes, workplaces, roadsides, and gardens.

The questionnaire was based on World Health Organisation (WHO) guidelines for tobacco smoking surveys.<sup>9</sup> Participants were asked "Have you ever smoked even one cigarette?" Those who answered "yes" were asked two further questions; "Have you ever smoked at least once per week for three months or more?" and, "How often have you smoked during the last three months?" Cessation ratios were calculated as the ratios of ex-smokers to ever-smokers.

Data coding, entry, and analysis was carried out using appropriate personal computer-based statistical packages. Adjusted prevalence estimates and confidence intervals (CIs) were calculated using the method of Cochran.<sup>10</sup>

## Results

At the time of the 1986 census, the villages and census blocks chosen for this study contained 5175 people aged 20 years and over (11.8% of the total national population of similar age). The informal census conducted as part of this study provided a similar count. Therefore we estimate that the number of participants in the survey (4056) represents approximately 78% of those eligible. Of those asked to participate in the survey, only four persons refused.

Of the 4056 respondents to the survey, 1665 (41%) reported that they had smoked during their life ("ever-smokers"), and 1585 (39.1%) reported that they had smoked at least one cigarette per week for three months or more. 1465 respondents (36.1%) reported that they had smoked in the three months prior to the

survey ("current smokers"). Of the ever-smokers, 200 reported that they had not smoked at all in the previous three months, and this group was labelled "ex-smokers".

Amongst current smokers, 93% of men reported that they smoked every day, as did 89% of women.

The overall prevalence of smoking in the population of Tonga aged 20 and over, adjusted by Cochran's method, was estimated to be, for current smoking, 64.8% (95% CI = 58.7-71.0) for men and 13.7% (95% CI = 9.9-17.6) for women. The adjusted prevalence estimates for ever-smoking were 70.1% (60.1-79.5) for men and 18.1% (13.3-22.9) for women. The prevalence of smoking, by sex and age group, is shown in table 1.

The independent association of age, sex, years of education, and district of residence with prevalence of smoking was examined using a logistic regression model. This analysis showed that the frequency of ever-smoking increased with years of age, decreased with years of education, and was more common amongst men than women (figure 1). There were statistically significant interactions of sex with years of education and district of residence (table 2).

Smoking cessation ratios were calculated for specific age and sex groups, and are displayed in figure 2.

## Discussion

The major finding from the survey is the high prevalence of smoking amongst men. Almost

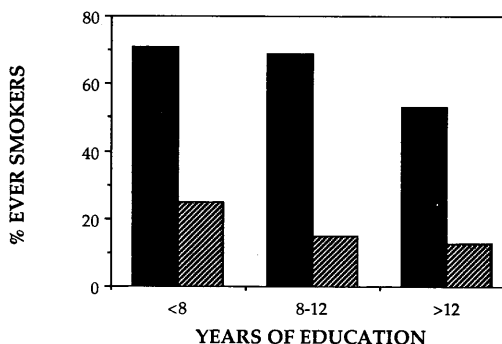


Figure 1 Prevalence of ever-smoking by years of education, Tonga 1991. ■ male, ▨ female.

Table 1 Prevalence of current smokers and ex-smokers, by sex and age group (percentages shown in brackets), Tonga 1991

Age group	Males				Females			
	Current smoker	Ex-smoker	Never-smoker	All	Current smoker	Ex-smoker	Never-smoker	All
20-24	203 (60.4%)	11 (3.3%)	122 (36.3%)	336	35 (9.8%)	6 (1.7%)	316 (88.5%)	357
25-29	137 (60.7%)	5 (2.2%)	84 (37.2%)	226	26 (9.9%)	4 (1.5%)	234 (88.6%)	264
30-34	112 (64.4%)	6 (3.5%)	56 (32.2%)	174	40 (16.5%)	1 (0.1%)	201 (83.1%)	242
35-39	119 (74.8%)	11 (6.9%)	29 (18.2%)	159	33 (14.9%)	6 (2.7%)	182 (82.4%)	221
40-44	76 (58.9%)	8 (6.2%)	45 (34.9%)	129	26 (12.9%)	6 (3.0%)	170 (84.2%)	202
45-49	88 (63.8%)	8 (5.8%)	42 (30.4%)	138	21 (11.5%)	6 (3.3%)	155 (85.2%)	182
50-54	102 (68.0%)	7 (4.7%)	41 (27.3%)	150	33 (17.1%)	4 (2.1%)	156 (80.1%)	193
55-59	84 (64.1%)	10 (7.6%)	37 (28.2%)	131	23 (14.8%)	11 (7.1%)	121 (78.1%)	155
60-64	81 (66.4%)	12 (9.8%)	29 (23.8%)	122	21 (16.3%)	10 (7.8%)	98 (76.0%)	129
65-69	48 (54.5%)	10 (11.4%)	30 (34.1%)	88	23 (26.1%)	5 (5.6%)	60 (68.2%)	88
70-74	39 (60.9%)	5 (7.8%)	20 (31.3%)	64	13 (15.5%)	8 (9.5%)	63 (75.0%)	84
75-79	23 (43.4%)	12 (22.6%)	18 (34.0%)	53	7 (14.6%)	7 (14.6%)	34 (75.6%)	48
80 and over	18 (43.9%)	11 (26.8%)	12 (29.3%)	41	15 (25.9%)	10 (17.2%)	33 (56.9%)	58
All ages	1130 (62.4%)	116 (6.4%)	565 (31.2%)	1811	316 (14.2%)	84 (3.8%)	1823 (82.0%)	2223

Table 2 Factors associated with lifetime ever-smoking in multiple logistic regression, Tonga 1991

Variable	Parameter estimate	Standard error	Relative risk	95% CI
Age (years)	0.009	0.002	1.01	1.005-1.014
Years of education:				
female	-0.115	0.0242	0.89	0.85-0.93
male	-0.052	0.0213	0.95	0.91-0.99
Sex: (male vs female; educ = 6, dist = 1)	1.242	0.3542	3.46	1.73-6.93
District				
2 vs 1 female	-0.365	0.228	0.69	0.44-1.10
male	0.162	0.214	1.18	0.77-1.79
3 vs 1 female	-0.378	0.189	0.69	0.47-0.99
male	0.594	0.183	1.81	1.27-2.59
4 vs 1 female	0.196	0.287	1.22	0.69-2.14
male	0.682	0.294	1.98	1.11-3.52
5 vs 1 female	-0.983	0.226	0.37	0.24-0.58
male	0.388	0.205	1.47	0.99-2.20
6 vs 1 female	-0.810	0.222	0.45	0.29-0.69
male	0.645	0.210	1.91	1.26-2.88

Note: Districts 1 = Kolofo'ou, 2 = Kolomotu'a, 3 = Tongatapu, 4 = Eua, 5 = Ha'apai, 6 = Vava'u.

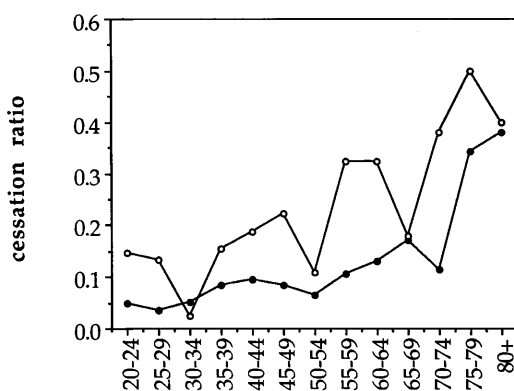


Figure 2 Cessation ratio (ex-smokers: ever-smokers) by age and sex. —●— male, —○— female.

two-thirds of males aged 20 years and over reported that they had smoked in the previous three months, and more than 90% of these men smoked daily.

In this survey the participation rate was high, and there were very few refusals. The most common reasons for missing eligible adults were fishing, work in gardens that were some distance from the village, and short trips to other parts of the Kingdom. (We included as eligible adults those who "usually" lived in the village but had not spent the previous night there. If the strict census definition had been applied, the participation rate in the survey would be considerably greater than 80%.)

It is likely that the survey over-sampled older age groups. (Persons aged 50 and over made up 27.7% of all Tongans over 20 in the 1986 census. In this study, the 50 and over category made up 34.7% of the total.) Also, males were under-represented (survey sex ratio = 0.81, census sex ratio = 0.94). As a consequence, if there is error in the results due to missing information, it is likely to have resulted in an under-estimate of the overall (population) smoking prevalence.

The survey relied on self-reports of smoking behaviour. The questions were well-understood and readily answered, they were not the principal focus of the survey and, in general, in Tonga no social stigma is associated with smoking. (Although smoking by young women

is often regarded with disapproval.) Overall, we believe that the self-reported data are likely to be unbiased measures of true smoking behaviour in this study population.

Levels of smoking in this survey are higher than those reported amongst Tongan men in New Zealand (in 1981 50% aged 15 and over smoked regularly, as did 19% of Tongan women<sup>11</sup>). However, the survey gives lower rates of smoking amongst men and women than reported by Finau *et al.*<sup>4</sup> This seems unlikely to be due to differences in the definition of smoking, or age structures of the study populations (the sex-specific prevalence figures reported by Finau *et al.* were not reached in any age category in the 1991 survey). If there has been a real decline in the prevalence of smoking, this is welcome. However, this is unlikely. Tonga imports all its tobacco products, and trade figures show that the quantity of cigarettes brought into the country rose by 50% from 1981 to 1990, during which time the national population increased by no more than 4-5% (unpublished, Department of Statistics). An unknown part of this rise may be due to increased tourism and duty-free shopping. Nevertheless the prevalence of smoking amongst Tongan men is higher than figures for most of the Pacific countries,<sup>2</sup> and is more than twice the prevalence of smoking that now exists in New Zealand and Australia.<sup>12</sup>

The pattern of smoking by age shows no sign of a cohort effect on uptake of smoking. The difference between the sexes is marked, and is greater in younger age groups. In Tonga smoking is said to be tolerated more readily amongst older women than younger, a social pattern that is repeated in a number of other countries in Asia,<sup>13</sup> and this is consistent with the pattern shown in table 1.

Other studies in the Pacific have reported a stronger effect of income or education on smoking prevalence for men than women.<sup>3</sup> This was not noted here - in this study the reduction in smoking prevalence with increasing years of education tended to be greater for women than men (table 2).

Finau *et al.*<sup>4</sup> found that the prevalence of smoking was higher in urban than rural areas

for women, although not for men. In this study the prevalence of ever-smoking was higher amongst men in all districts outside the capital city than in Nuku'alofa (table 2), while the reverse was true for women (with the exception of Eua, where no difference was observed). Very similar results were obtained for current smoking. The distinction between urban and rural residence in Tonga is not sharply defined. Nevertheless, it is notable that smoking patterns differed between Nuku'alofa and the remainder of the country, and that patterns were not the same for men and women. Closer examination of these differences may provide clues for prevention. For example, there may be a weakening in the city of traditional social restrictions on smoking by young women, and differences in disposable income and access to cigarettes may apply between districts.

As far as the data in this study go, there is no evidence that urban populations smoke more heavily – the proportion of current smokers who reported that they were smoking daily was 93 % in Nuku'alofa, 94 % in Eua, and 91 % in Ha'apai.

In this study, cessation ratios tend to increase with age, although in men the ratio of ex-smokers to ever-smokers changes little until age 70 and over. Women smokers are more likely to report that they have stopped than men, at all ages. Finau *et al* reported a similar finding, and Waldron *et al*<sup>13</sup> argue that in non-Western societies in general women are more likely to stop smoking than men. In contrast, in developed countries quit rates tend to be higher amongst men than women, although the difference appears to be diminishing.<sup>14,15</sup>

It should be noted that this study relied entirely on self-reporting, as has most research carried out in developing countries. It is possible that under-reporting of current smoking by younger women, in response to perceived social pressure, may contribute to the pattern observed in figure 2.

Medical staff in Tonga report the impression that women commonly stop smoking during pregnancy, and this is strongly encouraged by antenatal education and prevailing social attitudes regarding pregnancy. Another possible reason for a higher cessation ratio in women may be that they tend to be lighter smokers than men, and are more likely to have experimented with smoking without establishing a regular pattern of cigarette consumption. In this population a lower proportion of female ever-smokers had smoked at least once a week for three months or more (92.5 %) than male ever-smokers (97.5 %). However, when the small group of "experimental" smokers was excluded, the proportion of female ever-smokers who had stopped smoking remained considerably greater than amongst males (21 % compared with 8 %).

There was no association of cessation ratio with years of education, amongst men or women. Neither did the ratio of ex-smokers to ever-smokers differ consistently between Nuku'alofa and other districts, when the results for men and women were examined separately. If new behaviours begin in the

cities, one might hope to see rejection of smoking first in the major urban area of Tonga, but there is no sign in these data of such a trend.

What effect may this pattern of smoking have on future disease trends in Tonga? This is an important question for public health and the managers of health services, because it is not known how closely the experience of cohorts in developed countries will be repeated in this region. The background of disease in the Pacific differs from that in North America or Europe. For instance, in the Pacific there is an increasing frequency of vascular disease associated with particular dietary patterns, obesity, and possibly, genetic factors influencing carbohydrate metabolism.<sup>16</sup> These risk factors may interact with the cardio-toxic components of cigarette smoke to magnify the effects of smoking on coronary heart disease and peripheral vascular disease. Pacific islanders may also be particularly susceptible to smoking-related chronic obstructive lung disease; Maori and other Polynesians are known to suffer high background rates of bronchiectasis,<sup>17</sup> possibly due to genetic factors and high rates of early childhood lower respiratory tract illness. The magnitude of the disease burden due to smoking will vary also with age of smoking initiation and daily cigarette consumption; our study did not collect information on these two important variables.

What steps should be taken to reduce smoking and prevent smoking-related disease in Tonga? Taxation of tobacco products has been demonstrated elsewhere in the Pacific to influence consumption strongly.<sup>18</sup> There is no local tobacco industry in Tonga and levies on imported cigarettes have increased by 50 % since 1989. In dollar terms the price of cigarettes is approximately half that in Australia or New Zealand, although lower disposable household incomes mean that cigarettes are less affordable in Tonga for most people. Nevertheless, there is a strong case on health grounds for further increases in the taxes on the import and sale of tobacco.

There have been moves taken recently to strengthen health education programmes against smoking, with the assistance of non-governmental organisations, and especially in the area of antenatal education. However, on the basis of our survey's findings, there is plainly a need to expand these activities. The patterns of smoking for men and women are very different and specific education strategies will be indicated. It will be necessary also to adopt other measures to inform the population of the health risks of smoking. For example, although cigarettes in Tonga are mostly manufactured in New Zealand or Australia, packets carry no warning labels nor any information on tar and nicotine content. Such information should be provided, and a model which may be considered in Tonga is the legislation on cigarette packaging requirements that will shortly be introduced in Australia. It would be a mistake to simply reproduce the Australian warnings – the health messages will very prob-

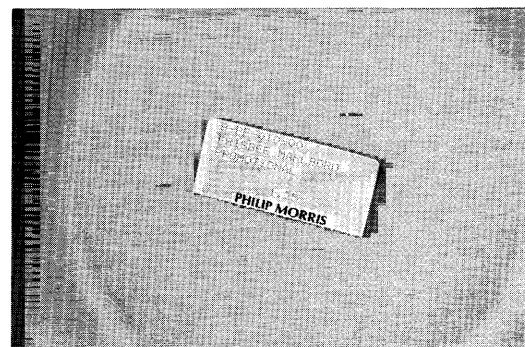
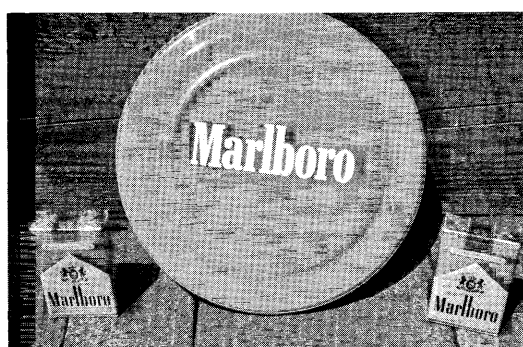
ably need to be adapted for use in Tonga, in terms of language and content. Research should be undertaken to identify the most effective warnings for the local population and these warning labels should then be made mandatory.

There are few restrictions at present in Tonga on the promotion of smoking. Advertising is permitted on radio, and cigarettes are widely promoted through newspapers, magazines, and billboards. Tobacco sponsorship of sport occurs, as it does throughout the Pacific (for example, Rothmans provided \$400 000 sponsorship for the South Pacific games in Papua New Guinea in 1991). With a fine touch of irony, Benson and Hedges (Tonga) recently publicised its image of social responsibility by sponsoring a child to travel to Australia for biliary tract surgery.

A tobacco control strategy for Tonga must contend with the interests that seek to maintain and expand use of tobacco products. Tonga should consider adopting the legislative measures introduced in Australia and New Zealand to prevent promotion of products now known to be the major preventable cause of ill-health, throughout the Pacific.

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Marlboro "Frisbee". This toy was on sale at the Philip Morris (PM) manufacturing plant in Richmond, Virginia in 1990, and was labelled FRISBEE (a trademark of the Whamo Corporation). The toy was not a Frisbee. PM withdrew it from the gift shop when the owner of the trademark protested. PM had maintained that it does not allow its cigarette brand names and logos to be used on toys. — John Slade